CLAIMS

1. Method of producing an acoustic output at a given frequency lying within a predetermined frequency range, the method comprising the steps of:

providing a member capable of excitation in a plurality of bending waveforms at respective frequencies distributed over the predetermined frequency range;

providing means for impulse excitation of said member at a plurality of regions of said member;

exciting said regions with impulses; and

integrating said impulses within said member so as to excite at least one selected bending waveform at said given frequency, thereby producing an acoustic output at said given frequency.

2. Method of producing an acoustic output at a given frequency lying within a predetermined frequency range, the method comprising the steps of:

providing a member capable of excitation in a plurality of bending waveforms at respective frequencies distributed over the predetermined frequency range;

providing means for impulse excitation of said member at a plurality of regions of said member; and

exciting said regions with impulses, with time delays between the impulses applied to different regions being selected to excite at least one selected bending waveform at said given frequency, thereby producing an acoustic output at said given frequency.

3. Method according to claim 2, wherein said time delay is substantially equal to the time taken by a bending wave at said given frequency to travel between neighbouring regions.

4. Method of producing an acoustic output at a given frequency lying within a predetermined frequency range, the method comprising the steps of:

providing a member capable of excitation in bending at a frequency lying within said predetermined frequency range;

providing means for impulse excitation of said member at a plurality of regions of said member; and

simultaneously exciting selected regions of said member to thereby excite a selected bending waveform having said given frequency and produce an acoustic output at said given frequency.

5. Method according to any one of claims 1 to 4, wherein the step of providing a member comprises providing a member having a plurality of regions spaced apart by less than the bending wavelength at the high frequency limit of said range.

6. Method according to any one of claims 1 to 4, further comprising the step of selecting the duration of each impulse so as to control the total harmonic distortion of the acoustic output.

7. Method according to any one of claims 1 to 4, further comprising the step of selecting the number of

excitation impulses applied to control the volume of the acoustic output.

8. Method according to any one of claims 1 to 4, wherein the step of exciting said regions with impulses comprises using impulses generated by transducers.

9. Method according to claim 8, wherein said transducers are mounted to said regions.

10. Method according to any one of claims 1 to 4, wherein the step of exciting said regions comprises exciting said regions in a bipolar manner.

11. Method according to claim 10, wherein excitation of said regions is by pairs of unipolar exciters mounted on either side of the member and at positions corresponding to said regions.

12. Method according to any one of claims 1 to 4, wherein the step of providing a member comprises providing a member having dimensions and elastic properties such that bending waves at frequencies lying within said predetermined frequency range are restricted to one axis of the member.

13. Method according to any of claims 1 to 4, wherein the step of providing a member comprises providing a member having dimensions and elastic properties such that bending waves at frequencies lying within said predetermined frequency range occur in the plane of the member.

14. Method according to claim 13, wherein the member is in the form of a plate.

15. Method according to claim 14, wherein the step of providing means for impulse excitation comprises providing a two-dimensional array of transducers.

16. Method according to claim 13, wherein the step of providing means for impulse excitation comprises providing a two-dimensional array of transducers.

17. Method according to any one of claims 1 to 4, wherein the step of exciting said regions comprises exciting said regions so as to simultaneously produce an acoustic output at a plurality of frequencies.

18. Method according to any one of claims 1 to 4, wherein the step of providing a member comprises providing a member which is a linear integration medium.

19. Method according to any one of claims 1 to 4, wherein the step of exciting said regions comprises exciting said regions by the application of forces.

20. Method according to any one of claims 1 to 4, wherein the step of exciting said regions comprises exciting said regions by the application of bending moments.

21. Apparatus for producing an acoustic output at a given frequency lying within a predetermined frequency range, the apparatus comprising:

a member capable of excitation in a plurality of bending waveforms at respective frequencies distributed over the predetermined frequency range; and

means for impulse excitation of said member at a plurality of regions of said member and with time delays between the impulses applied to different regions selected so as to excite at least one selected bending waveform at said given frequency, thereby producing an acoustic output at said given frequency.

22. Apparatus according to claim 21, wherein said means for impulse excitation comprises control means for selecting said time delay in response to an input signal corresponding to the required frequency of acoustic output.

23. Apparatus for producing an acoustic output at a given frequency lying within a predetermined frequency range; the apparatus comprising:

a member capable of excitation in bending at a frequency lying within said predetermined frequency range; and

means for simultaneous impulse excitation of selected regions of said member to thereby excite a selected bending waveform having said given frequency and produce an acoustic output at said given frequency.

24. Apparatus according to claim 23, wherein said means for simultaneous impulse excitation comprises control means for selecting regions to be excited in response to an input signal corresponding to the required frequency of acoustic output.

25. Apparatus according to any of claims 21 to 24, wherein said means for impulse excitation comprises control

means for selecting the number of regions to be excited in response to an input signal corresponding to the required volume of acoustic output.

26. Apparatus according to any of claims 21 to 24, wherein said means for impulse excitation comprises control means for selecting the duration of each impulse in response to an input signal corresponding to the required total harmonic distortion of the acoustic output.

27. Apparatus according to any of claims 21 to 24, wherein said means for impulse excitation comprises control means for selecting the number of excitation impulses applied in response to an input signal corresponding to the required volume of the acoustic output.

28. Apparatus according to any of claims 21 to 24, wherein said regions are spaced apart by less than the bending wavelength at the high frequency limit of said predetermined frequency range.

29. Apparatus according to any of claims 21 to 24, wherein said means for impulse excitation comprises transducers for exciting said regions.

30. Apparatus according to claim 29, wherein said transducers are mounted to said regions.

31. Apparatus according to claim 30, wherein said transducers are bipolar.

32. Apparatus according to claim 30, wherein pairs of unipolar transducers are mounted on either side of said member and at positions corresponding to said regions.

33. Apparatus according to claim 29, wherein said transducers are bipolar.

34. Apparatus according to claim 29, wherein pairs of unipolar transducers are mounted on either side of said member and at positions corresponding to said regions.

35. Apparatus according to any of claims 21 to 24, wherein said member has dimensions and elastic properties such that bending waves at frequencies lying within said predetermined frequency range are restricted to one axis of the member.

36. Apparatus according to any of claims 21 to 24, wherein said member has dimensions and elastic properties such that bending waves at frequencies lying within said predetermined frequency range occur in the plane of the member.

37. Apparatus according to claim 36, wherein said member is a plate.

38. Apparatus according to claim 37, wherein said means for impulse excitation comprises a two-dimensional array of transducers.

39. Apparatus according to claim 36, wherein said means for impulse excitation comprises a two-dimensional array of transducers.

40. Apparatus according to any of claims 21 to 24, wherein said member is a linear integration medium.

41. Apparatus according to any of claims 21 to 24, wherein said means for impulse excitation applies forces to said regions.

42. Apparatus according to any of claims 21 to 24, wherein said means for impulse excitation applies bending moments to said regions.

43. A near-field loudspeaker incorporating the apparatus of any one of claims 21 to 24.

44. A telephone incorporating a near-field loudspeaker according to claim 43.

45. A headset incorporating a near-field loudspeaker according to claim 43.

46. A near-field loudspeaker operating according to the method of any one of claims 1 to 4.

47. A telephone incorporating a near-field loudspeaker according to claim 46.

48. A headset incorporating a near-field loudspeaker according to claim 46.